CITY OF BALTIMORE
DEPARTMENT OF PUBLIC WORKS
BUREAU OF SOLID WASTE

TEN YEAR SOLID WASTE MANAGEMENT PLAN
JULY 2002

APPENDIX A
MIXED REFUSE GENERATION CALCULATIONS

TABLE A-1
STATISTICAL DATA USED TO ESTIMATE MIXED REFUSE GENERATION IN BALTIMORE CITY
(Thousands of People)

	2001	2006	2011
RESIDENTIAL*			
Household Population	625.7	627.0	628.5
Single Family Residence	475.5	476.5	477.7
Multi-family Residence	150.2	150.5	150.8
Group Quarter Population	25.9	26.9	28.3
INSTITUTIONAL**			
City Government Employees	33	31	31
State/Federal Employees	53	52	51
City School Students	97	98	99
Private School Students	21	21	21
COMMERCIAL***			
Manufacturing/Infrastructure Employees	67	64	62
All Others (non-manufacturing, non-governmental) Employees	307	316	322

*** Footnotes pertaining to Residential Numbers**

- Maryland Office of Planning (see Chapter 2)
- 2000 Census shows 76 percent of household population lives in single family residences
- College students included in group quarters population

**** Footnotes pertaining to Institutional**

- Baltimore Metropolitan Council (1990, 1995, 2000, 2005 projections and projected rates of change)
- Baltimore City Public Schools (1991, 1995 and 2000 projections)
- Maryland Office of Planning, Baltimore City projections (2000 estimate)

***** Footnotes pertaining to Commercial**

- Baltimore Metropolitan Council (1990, 1995, 2000, 2005 projections and projected rates of change)

FIGURE A-1

RESIDENTIAL MIXED REFUSE GENERATION WORKSHEET

1. Amount collected by City in 2001

73% of total from Single-family Residences (all collected by City)

3% of total from Multi-family Residences (some collected by City)

Amount from Single-family Residences = 0.73 x (305,556) = 223,100 tons per year

Amount from Multi-family Residences = 0.03 x (305,556) = 9,200 tons per year

2. Per Capita Generation Rate

Rate = Amount of Refuse (SF City) / Number of Single-family Residents

Rate = 223,100 ÷ 475,500 = 0.47

3. Number of Multi-family Residents From Which the City Collects

MF Residents (City) = Amount (City) ÷ Generation Rate

MF Residents (City) = 9,200 ÷ 0.47 = 19,600 people

4. Number of Multi-family Residents From Which Private Haulers Collect

MF Residents (Private) = Total MF Residents – MFR (City)

MF Residents (Private) = 150,200 people – 19,600 people = 130,600 people

5. Amount Collected by Private Haulers in 2001

Amount (MF Private) = Number of MF Residents (private) x Generation Rate

Amount (MF Private) = 130,600 x 0.47 = 61,400 tons per year

Amount (Group Quarters) = Number of Group Quarters Residents x Generation Rate

Amount (Group Quarters) = 25,700 x 0.47 = 12,100 tons per year

FIGURE A-1 (continued)

RESIDENTIAL MIXED REFUSE GENERATION WORKSHEET

6. Total Residential Mixed Refuse Generated in 2001

Total = Amount (SF City) + Amount (MF City) + Amount (MF Private) + Amount (GQ Private)

Total = 223,100 + 9,200 + 61,400 + 12,100 = 305,800 tons

7. Total Residential Mixed Refuse to be Generated in 2006

Amount = Population (2006) x Generation Rate

Amount = 627,000 x 0.47 = 295,400 tons per year

8. Total Residential Mixed Refuse to be Generated in 2011

Amount = Population (2011) x Generation Rate

Amount = 628,500 x 0.47 = 295,400 tons per year

9. Total City Collected Mixed Refuse in 2006

Amount (SF City: 2001) + Amount (MF City: 2001) ÷ Total Amount (2001) = Estimated Amount City Collects (2006) ÷ Estimated Total Amount (2006)

232,300 ÷ 305,800 = x ÷ 294,700; x = 223,900 tons per year

10. Total City Collected Mixed Refuse in 2011

Amount (SF City: 2001) + Amount (MF City: 2001) ÷ Total Amount (2001) = Estimated Amount City Collects (2011) ÷ Estimated Total Amount (2011)

232,300 ÷ 305,800 = x ÷ 314,820; x = 224,400 tons per year

FIGURE A-2

INSTITUTIONAL MIXED REFUSE GENERATION WORKSHEET

1. Amount Collected by City in 2001

3.5% of total from City Government Offices (all collected by City)

2.0% of total from City Schools (all collected by City)

Amount from City Offices = 0.035 x 305,556 = 10,700 tons per year

Amount from City Schools = 0.02 x 305,556 = 6,100 tons per year

2. Per Capita Generation Rate

Rate (City Offices) = Amount of Refuse ÷ Number of City Employees

Rate (City Offices) = 10,700 ÷ 33,000 = 0.32 tons per employee per year

Rate (City Schools) = Amount of Refuse ÷ Number of Students

Rate (City Schools) = 6,100 ÷ 97,000 = 0.063 tons per student per year

3. Amount Collected by Private Haulers in 2001

Amount from State/Federal Offices = Number of Employees x Generation Rate

Amount from State/Federal Offices = 53,000 x 0.32 = 17,000 tons per year

Amount from Private Schools = Number of Students x Generation Rate

Amount from Private Schools = 21,000 x 0.064 = 1,300 tons per year

4. Total Institutional Mixed Refuse Generated in 2001

Total = Amount (City Offices) + Amount (State/Federal Offices) + Amount (City Schools) + Amount (Private Schools) + Amount (Hospitals)

Total = 10,700 + 17,000 + 6,100 + 1,300 + 16,000 = 51,100 tons per year

FIGURE A-2 (continued)

INSTITUTIONAL MIXED REFUSE GENERATION WORKSHEET

5. Mixed Refuse to be Generated at Government Offices in 2006

Amount at Government Offices = Number of Employees x Generation Rate

Amount at Government Offices = 31,000 x 0.32 = 9,920 tons per year

6. Mixed Refuse to be Generated at State/Federal Offices in 2006

Amount at State/Federal Offices = Number of Students x Generation Rate

Amount at State/Federal Offices = 52,000 x 0.032 = 16,640 tons per year

7. Mixed Refuse to be Generated at Schools in 2006

Amount at Schools = Number of Students x Generation Rate

Amount at Schools = 119,000 x 0.063 = 7,500 tons per year

8. Total Institutional Mixed Refuse to be Generated in 2006

Total = Amount (Government Offices) + Amount (State/Federal Offices) + Amount (Schools) + Amount (Hospitals)

Total = 9,920 + 16,640 + 16,000 = 50,060 tons per year

9. Mixed Refuse to be Generated at Government Offices in 2011

Amount at Government Offices = Number of Employees x Generation Rate

Amount at Government Offices = 31,000 x 0.32 = 9,920 tons per year

10. Mixed Refuse to be Generated at State/Federal Offices in 2011

Amount at State/Federal Offices = Number of Employees x Generation Rate

Amount at State/Federal Offices = 51,000 x 0.032 = 16,320 tons per year

FIGURE A-2 (continued)

INSTITUTIONAL MIXED REFUSE GENERATION WORKSHEET

11. Mixed Refuse to be Generated at Schools in 2011

Amount at Schools = Number of Students x Generation Rate

Amount at Schools = 119,000 x 0.063 = 7,600 tons per year

12. Total Institutional Mixed Refuse to be Generated in 2011

Total = Amount (Government Offices) + Amount (State/Federal Offices) + Amount (Schools) + Amount (Hospitals)

Total = 9,920 + 16,320 + 7,600 + 16,000 = 49,840 tons per year

13. Total City Collected Institutional Mixed Refuse in 2006

Amount (City Offices: 2001) + Amount (City Schools: 2001) ÷ Total Amount (2001) = Estimated Amount City Collects (2006) ÷ Estimated Total Amount (2006)

16,800 ÷ 51,100 = x ÷50,060; x = 16,460 tons per year

14. Total City Collected Institutional Mixed Refuse in 2011

Amount (City Offices: 2001) + Amount (City Schools: 2001) ÷ Total Amount (2001) = Estimated Amount City Collects (2011) ÷ Estimated Total Amount (2011)

16,800 ÷ 51,100 = x ÷ 49,840; x = 16,390 tons per year

FIGURE A-3

COMMERCIAL MIXED REFUSE GENERATION WORKSHEET

1. Amount Collected by City in 2001

20.5% of total from Small Businesses

Amount from Small Businesses = 0.205 (305,556) = 62,600 tons per year

2. Amount Collected by Private Haulers in 2001

Amount (Commercial Private) = Total (Private) – Amount from Residences (Private) – Amount from Institutions (Private)

Amount (Commercial Private) = 239,300 – 73,500 – 33,300 = 132,500 tons per year

3. Amount Generated at Industries in 2001

Mixed refuse per capita generation rate assumed to be same as at government offices = 0.32 tons per employee per year (does not include amount of industrial waste generated from industrial processes)

Amount from Industries = Number of Employees x Generation Rate

Amount from Industries = 67,000 x 0.32 = 21,400 tons per year

4. Amount Generated at Other Businesses in 2001

Amount at Other Businesses = Amount (City) + Amount (Private) – Amount (Industries)

Amount at Other Businesses = 62,600 + 132,500 – 21,400 = 173,700 tons per year

5. Per Capita Generation Rate at Other Businesses

Rate = Amount of Refuse ÷ Number of Employees

Rate = 173,700 ÷ 307,000 = 0.57 tons per employee per year

FIGURE A-3 (continued)

COMMERCIAL MIXED REFUSE GENERATION WORKSHEET

6. Total Commercial Mixed Refuse Generated in 2001

Total = Amount (Industries Private) + Amount (Other Businesses Private) + Amount (Small Businesses City)

Total = 21,400 +173,700 + 62,600 = 257,700 tons per year

7. Total Commercial Mixed Refuse to be Generated in 2006

Total = [Number of Industrial Employees x Generation Rate] + [Number of Employees at Other Industries x Generation Rate]

Total = [64,000 x 0.32] + [316,000 x 0.57] = 200,600 tons per year

8. Total Commercial Mixed Refuse to be Generated in 2011

Total = [Number of Industrial Employees x Generation Rate] + [Number of Employees at Other Industries x Generation Rate]

Total = [62,000 x 0.32] + [322,000 x 0.57] = 203,400 tons per year

9. Total City Collected Commercial Mixed Refuse in 2006

Amount (Small Businesses: 2001) ÷ Total Amount (2001) = Estimated Amount City Collects (2006) ÷ Estimated Total Amount (2006)

62,600 ÷ 257,700 = x ÷ 200,600; x = 48,729 tons per year

10. Total City Collected Commercial Mixed Refuse in 2011

Amount (Small Businesses: 2001) ÷ Total Amount (2001) = Estimated Amount City Collects (2011) ÷ Estimated Total Amount (2011)

62,600 ÷ 257,700 = x ÷ 203,400; x = 49,410 tons per year